Vol. V. No. 7. July 15, 1908.

THE

PSYCHOLOGICAL BULLETIN

A PHYSIOLOGICAL INTRODUCTION TO THE STUDY OF PHILOSOPHY.[1]

BY DR. SHEPHERD IVORY FRANZ,

Government Hospital for the Insane, Washington.

Although from time to time we read that much of so-called physiology is psychology, that too much of so-called psychology is physiology, that the physiology of the nervous system exists only by reason of psychological observations and that psychology must return more to introspective methods, there appears to be an agreement among teachers and text-book writers that a certain amount of physiology is necessary for psychological teaching and thinking. Opinions differ, however, regarding the *What?* and the *How Much?* of physiology that are essential or valuable. Beyond the barest outline of the physiology of the central nervous system and the special senses to be found in the text-books of psychology, where may the teacher or the student look for further knowledge? In English, Ferrier's *Functions of the Brain*, which was the standard at the time the reviewer was a student and which, although out of date, still remains in many respects unsurpassed, has not been succeeded by any single English work that may be utilized for the instruction of psychological students in what may be properly called physiological psychology. In both French and German, however, there are a number of books or parts of books that may be profitably placed before the more competent students of psychology, but unfortunately too few students are able to profit by the reading of the foreign language. Probably the most noteworthy of these works from the psychological standpoint are the excellent articles on the brain in Richet's *Dictionnaire de Physiologie*,

[1] *Introduction physiologique à l'étude de la philosophie.* J. GRASSET. Préface par M. BENOIST. Paris: Alcan, 1908. Pp. xii+368.

and those of von Monakow in *Ergebnisse der Physiologie*. In addition to these there are some special works dealing with the structure and function of the nervous system. Few, however, are like Grasset's work in that they have been written for the special or the probable use by students of psychology.

In the preface we are told by M. Benoist, the rector of the University of Montpellier, that the contents of the book were given in the form of lectures to students of philosophy in the university in accordance with a general plan of having specialists in the sciences and in other subjects allied to philosophy lecture on their own subjects to the students of philosophy and psychology. In addition to the lectures of Professor Grasset there were given lectures on certain fundamental principles of physics, biology, law and ethics, and history by the respective professors, as an indication of the value of these subjects to students of the more inclusive subject, philosophy.

Professor Grasset's book is not intended to be exhaustive in its treatment of the nervous system, but it is intended to give to students of philosophy and psychology facts and principles that may be of value to them in their work. It is divided into three parts: Definitions and Generalities; Psychic Functions; and Psychomotor and Psychosensorial Functions.

In the first part of the book is to be found the author's creed regarding the relation of physiology and psychology, and some general remarks pertaining to the point of view. The author believes that psychology and physiology are two sciences, not one science with two different aspects, as some physiologists would have us believe. Psychology is in close connection with philosophy, and it may be necessary to hold certain philosophical opinions in order to produce good work or consistent work. In physiology, however, one must have no philosophical opinions to advance and, further, one must have no special religious opinion to combat or to champion. On the other hand, the author holds that the physicist, the physiologist and neurobiologist can make their sciences serious and definite only if they have a real and a strong philosophical education. How unlike the usual or ordinary antagonism of scientists toward philosophy is the latter statement!

When we consider the body and its parts, their location and function, we are struck with the fact that the anatomical unity is not always the same as the functional unity. Thus in the stomach, an anatomical unit, there are a number of functional unities. In the study of life the functional unities are the important differentiating elements,

and it may be said that the individuality of an apparatus depends upon the function of that apparatus regardless of the geography or the topographical distribution of the apparatus or organ. "The history of the taste nerve is the best proof of the independence of the true physiological unities and of the false anatomical unities" (p. 336). It is the province of the physiologist, therefore, to determine the real unity of any organ or group of organs. In the nervous system it cannot be doubted that the anatomical unity is an artificial construction, for no one can say where the spinal cord begins and the medulla stops, nor where the cerebrum begins and the mid-brain ends, and we are compelled to concede the preponderating importance to the physiological or the functional view. In this sense we may take the remark of Lamarck: "The function creates the organ." The word organ has a definite meaning only from the physiological point of view, it is a something that does some definite thing. The organ is defined by the function that it accomplishes, and we may not properly speak of the spinal cord or of the cerebrum except in common language, because for the physiologist the spinal cord and the medulla oblongata and the cerebellum and the cerebrum do not exist as distinct unities, they are interrelated into one functioning organ. This standpoint has been taken throughout the book and we will look in vain for special discussions of the functions of the spinal cord and the peripheral nerves, or of any of the other anatomical divisions of the nervous system. We are to deal with the anatomical localization of functions, but more especially shall we read of the functions and their anatomical connections. In other words, for example, we are not to lay the emphasis on the location of the hearing centers in the temporal lobes or of the visual centers in the occipital lobes, but we must consider the relation of hearing and of vision to the nervous system as a whole. In the case of hearing it is the connection or the functional relation of the cochlear nucleus to the posterior quadrigeminal body, to the geniculate body, and to the temporal lobe that is of importance. In vision it is the similar relation of quadrigemina, geniculata, and the pulvinar and the occipital lobes that is to be considered. Moreover, in both these cases we must realize that the goal is not the cortex of the cerebrum, but that there are outgoing paths to take the centripetal impulses and to make them mean something for the individual by producing an ontward expression. In this discussion the author considers the usual method of presentation of the functions of the nervous system and makes war on the habit of phylogenetic presentation, which must be largely anatomical. For the proper understanding of the functions of

the nervous system Grasset believes that we must first consider the most highly developed system and descend to the simple, not ascend from the simple to the complex. For the investigation and understanding of other bodily systems it may be advantageous to go from the amœba to man, but we are able to understand the nervous system of the lower animals only after having considered the nervous system of man and not the reverse.

Part two is devoted to the 'psychic functions.' In this part the author discusses and defines some terms, divides mental states into two 'psychisms,' gives a critical résumé of the facts of anatomical localization of psychic functions, and considers the problem of responsibility and mental therapeutics.

The word psychic has not the same connotation as the words mental and consciousness. The psychic functions are defined as those in which there is 'thought' — not intellectual as opposed to affective, but both intellectual and affective — and which are produced or developed in the neurones of the cerebral cortex (p. 34). Consciousness is not necessarily a characteristic of a psychic state, and the mental is only a part of the psychic, for (interesting definition) psychic functions have their seat over all the cerebral cortex while the mental are located exclusively in one part or in parts of the cerebral cortex. The psychic functions are divided into the superior (voluntary and conscious) and the inferior (involuntary and unconscious), and for these two orders of psychic functions there are two different centers. The centers for the superior and the inferior psychic functions are, according to Grasset, respectively the frontal and the parieto-occipital parts of the cortex. He criticizes and combats the idea that both psychic functions are concerned with the same neurones, but with different degrees or intensities of activity, a position held by Janet, Dumas, Binet and Hitzig. To make his views more easily understood Grasset constructed the accompanying figure, which he later refers to as the 'polygon.'

In this figure *O* represents the superior psychic center or the center of conscious personality, of free will, of the responsible ego, which the author locates in the cortex of the prefrontal lobe. *A* is the auditory center, located in the cortex of the temporal lobes; *V* the visual center, located in the region of the calcarine fissure; *T* the tactile and general sensibilities, localized in the region about the fissure of Rolando; *W* the center for writing, in the cortex at the foot of the left second frontal convolution; *S* the center for speech, cortex at the foot of the left third frontal convolution; and *K* the kinetic

center or the center for general movements, located in the cortex about the fissure of Rolando. *O* represents all the neurones for the superior psychic functions, while the more numerous inferior psychic centers are represented by the polygon *WSKAVT*. To *A* go all the different auditory impressions, to *V* the visual, and to *T* the tactual and general sense impressions. From *W* there go out the impulses for graphic expression, from *S* those for verbal expression, and from *K* those for general bodily movement. This scheme represents only some of the important paths, and for completeness many more would need to be introduced from the sensory or the afferent side, such as those for taste and smell. In normal individuals, as shown

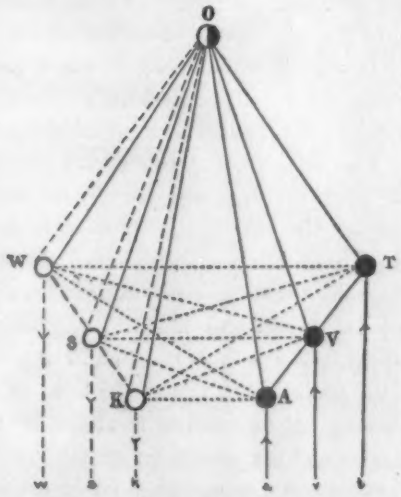

FIG. 1. Scheme of the center *O* and of the polygon *WSKAVT*.

in the figure, all the different centers are connected by association paths that assure collaboration and synergy. Between the superior psychic center *O* and the motor centers *W*, *S*, *K* the author assumes not only centrifugal paths, which permit the passage of impulses from the center *O* to the appropriate motor center, but also centripetal paths which transmit impulses from the motor centers to the higher center, whenever the activity of *W*, *S*, *K*, has been produced, whether by action of the center *O* or by the activity of the centers *A*, *V*, *T* in the inferior psychic level. This last form of discharge is apparently the substrate for a form of the 'feeling of innervation.'

Using this scheme as a basis Grasset attempts to explain a number of borderland and pathological states, such as sleep and dreams, hypnosis, motor automatisms, hysteria and the insanities, and the aphasias. Lack of space prevents taking up more than a few of these in detail, but all are explained as disaggregation or dissociation of parts of the mechanism. Most are due, we are told, to a temporary or permanent functional break between the *O* and the lower polygon. In sleep, for example, there is a cessation of the function of the superior psychic *O*, although psychic activity is not entirely suspended. The continuation of the functioning of the lower psychic centers constitutes or is the neural basis of dreaming. Hysteria, which has been well described as "an enfeeblement of the faculty of psychological synthesis, a contraction of the field of consciousness, and a tendency to a more or less complete division of the personality with the formation of many independent groups," is readily understood if we accept the scheme of Grasset as indicating the manner in which all psychic states are constituted. The hysterias are from this standpoint disaggregations of the different parts of the polygon, the functional breaking away of the different parts that go to make up the normal mental process.

In the next chapter the author considers from the polygonal point of view a number of psychological problems: sensibility, ideas, attention, memory, imagination, the association of ideas and images, inspiration, reason and judgment, and will. Then follow discussions of the functions relating to the preservation and the growth of the life of the individual, of the social man, and of the species. In each of these chapters the physiological or normal function is explained and the author adds discussions of the pathology of the mental condition. In these two chapters there are collected most of the important facts of pathological psychology, a subject with which the author is thoroughly personally acquainted, in the selection of which there is shown rare good judgment.

Grasset next treats of the localization of the 'psychism' in the cerebrum. To the question: Is the psychism localizable in the cerebrum? he answers: it is localizable, but we must not hastily conclude that it has been localized. The facts regarding the sensory functions of the cerebrum are given, Flechsig's researches on the association tracts are mentioned and the opinions of many physiologists are cited to show that most investigators of the question believe the frontal lobe concerned with the higher mental processes, if we may speak of such. The author quotes the reviewer as in favor of this hypothesis, but it may be said that this conclusion was not and is not the opinion of the

present writer.[1] The conclusions which are made after the consideration of all the facts are that the superior psychism is not, as Janet and Joffroy conclude, merely due to a different degree of the activity of the same neurones that subserve the lower psychism, that the frontal lobes are not chiefly concerned with emotional conditions, such as gaiety or sadness, but that when they are diseased there is an escape from inhibition of the lower centers which become hyperactive, and that for the further investigation of the problem it is necessary to have more careful analyses of the mental phenomena in pathological cases.

Chapters follow on the physiopathological problem of responsibility, psychic functions in therapeutics, language, emotion and mimicry, general sensitivomotor function, orientation and equilibrium, vision, hearing, taste, smell, and the functions of nutrition. The chapters on responsibility and therapeutics are interesting largely to physicians, the former possibly also to ethical writers, although the author has published his conclusions regarding responsibility in more extended form in *Demifous et Demiresponsables*. In his discussion of language the author combats the opinions of Marie, who, it will be remembered, says that "the third frontal convolution plays no special rôle in the function of language." The neural processes in emotion are as follows: there is an excitation of certain sensory centers in which the sensation is 'perceived, becomes emotion, and from which go out a double efferent excitation'; there is a stimulation of the optic thalamus centers or rather of the basilar optic thalamic — striate nuclei centers, thence a stimulation of the inferior bulbo-medullary centers whence go the excitations for the visceral, circulatory, respiratory and

[1] This is not the place in which to bring forward special evidence and to elaborate personal hypotheses, but to the reviewer the following tentative hypothesis appears to be the most acceptable: All parts of the cerebrum are engaged in intellectual processes. Or, to be more exact, we may say that all parts of the cerebral cortex are so engaged. Certain parts we know have definite sensory or perceptual functions, other parts are more intimately concerned with the production of movements, and still other parts are chiefly employed neither for sensation nor for movement, but for what has been called association. The two large and important areas, anterior and posterior, of association have the same general function, that of being connecting links between the sensory processes on the one hand and the motor products on the other hand. The two areas work in harmony, but the posterior receives impulses from the sensory centers and the anterior is mainly connected with the motor centers. In the formation of an association, the following neural processes are conceived to take place: stimulation of some sensory center or centers, transmission to the posterior association area, transmission to the anterior association area, transmission to the motor area, and impulse to lower motor centers.

digestive manifestations (p. 237). The emotion itself is due to certain discharges in the upper cerebral neurones. When an impression reaches the psychic neurones it produces the mental state sensation; "if the process be further complicated and it extend to a greater number of neurones the sensation becomes agreeable or disagreeable and there is pleasure or pain — if still further complicated we have an emotion, joy or sadness" (p. 83). The area about the fissure of Rolando is believed to be sensorimotor rather than divided into a motor region anterior to the fissure and a sensory region posterior to the fissure, as the clinical and physiological results teach. The occipital lobe is also both sensory and motor, and the hearing center has a similar combination of functions. The validity of these conclusions is, the reviewer believes, questionable in view of the many facts that have recently been collected by pathologists, clinicians and physiologists, and the author in these chapters appears an advocate and not a judge.

Although he uses his scheme of the polygon throughout and thus appears to have a materialistic standpoint, the author keeps in mind the fact that the mental state is not the anatomical nor the physiological condition. For him the mental state is something that is not the same as the action of the neurone, something that cannot be explained in terms of the physics and chemistry of nervous tissue. It is refreshing to pick up a book written by a physician and find that not only has the old anatomical standpoint given way to a functional one, but that the distinction is drawn between the purely functional and the mental.

Two serious defects of the work are the lack of an index and the absence of any quantity of references. Most of the references that are given are to French authors and magazines; full references to German authors are almost lacking, although names of both German and English investigators are mentioned.

For its standpoint and its numerous facts the book may be recommended; it appears to the reviewer that it will be more valuable to teachers than to students. For the use of students a little more anatomy would be helpful and this could be included without augmenting the size of the work if the chapters on responsibility and therapeutics were omitted. The illustrations are well selected and sufficiently numerous, and it is a relief not to find all the worn out cuts of earlier works. A translation of the book, with additions of chapters on anatomy, of an index and of a bibliography would fill one of the gaps in our series of physiological and psychological text-books.

PSYCHOLOGICAL LITERATURE.

PHYSIOLOGY OF HEARING.

An Introduction to the Mechanics of the Inner Ear. MAX MEYER. University of Missouri Studies, Science Series, Vol. II., No. 1, 1907. Pp. vi+140.

Meyer, as is well known, rejects not only the basilar membrane hypothesis, but also the entire resonance theory of audition, his reasons being, on the one hand, the difficulty which any resonance hypothesis finds in coping with some of the commonest phenomena of combination-tones, and on the other, the physiological consideration that no living tissue can be subjected without alteration of form to the conditions of unvarying tension which the resonance hypothesis demands. In the monograph before us his own mechanical theory of audition, first propounded some twelve years ago, is set forth in a continuous and systematic exposition, as far as the present condition of experimental and anatomical knowledge has permitted of its development. It is couched in untechnical terminology which any reader can follow.

The cochlea is a narrow tube some two centimeters in length. It is filled with lymph of such a density that the rate of sound transmission in it would be about 1,400 meters per second. This means that a sound in the middle region of the scale would have a wave-length of several meters. Consequently, to speak of sound waves travelling up and down the cochlear tube is like speaking of a horse race in a dog kennel. It is better to regard the fluid as practically incompressible, and hence as of uniform density throughout at any given time. When the sound waves of the air actuate the tympanic membrane and the chain of ossicles, the foot-plate of the stapes, which fits into the oval window of the cochlea, executes a piston-like movement and forces this incompressible fluid to move, the elastic membrane of the round window making this possible. Such a mass movement in the lymph is not to be confused with wave-motion.

If the cochlea, with these two windows at one end, were a plain tube, only that portion of the fluid which lies between the windows would be set in motion. But the windows are separated by a partition which extends almost to the opposite end of the tube. The au-

thor uses the term 'partition' to cover the whole organ of Corti, and not merely the membrana basilaris. This partition is not rigid like a wall of bone; neither according to our author is it elastic like a rubber membrane. Its physical properties are more like those of soft leather. As a rough illustration of the way in which such a structure might act, one may think of a leather-seated chair. Pressed from below the seat bulges upwards, offering almost no resistance at first, but soon stops abruptly. It will remain in this position until pressed from above, when it bulges downwards again until it reaches its lower limit.

Now if the partition in the cochlea is of this flexible but inelastic sort and can move up and down within narrow limits, the result will be that when the stapes begins moving inwards the part of the partition next to the windows will begin moving downwards. It soon reaches its lower limit and becomes unyielding. Continued inward motion of the stapes will gradually cause further and further portions of the partition to be depressed until the motion of the stapes is reversed. With this change of motion, the particles of fluid nearest the windows (not those that have moved down last) move upwards and raise the corresponding portion of the partition to its upper limit; then the parts farther from the windows are gradually raised as before. Any motion of the partition, whether up or down, begins at the point nearest the windows. The membrana basilaris is the strongest part of the partition, well adapted to resist the pressure of the fluid above and below. Upon it rest the rods of Corti, so placed as to at once support and protect the delicate hair cells whose hairs protrude upward into the membrana tectoria. When a portion of the partition bulges downward, this membrane pulls the hairs slightly, causing a single shock in all the nerve fibers which terminate about the hair cells of this part of the partition. If two or more of these shocks follow in rapid succession, a nervous process is set up whose special character is dependent upon the frequency of the shocks. The pitch of the perceived tone is consequently for this theory not a function of the particular sensory or cortical nerve cells stimulated, but corresponds to a particular kind of neural process which can take place in any one of thousands of neurones, and whose nature is determined by the rate of stimulation of the sensory cells. Loudness is correlated with the amount of neural stimulation: for instance, with great intensity of sound the amplitude of movement of the stapes is of course wide, the strip of the partition moved up and down is long and the number of hair cells stimulated is correspondingly large.

How is this theory to explain the simultaneous perception of several distinct tones? If the movements of the stapes when acted upon by a complex sound wave were such as to cause one portion of the partition to move up and down at one rate and other portions at different rates, the path would be open toward an explanation of clang analysis. This is precisely what this theory finds to be the case. The major portion of the monograph is devoted to a determination, by graphical methods, of the precise way in which the partition is affected by complex movements of the stapes. To simplify a problem which would otherwise be incapable of solution, several provisional assumptions are introduced regarding the shape and elasticity of the partition, the distribution of nerve termini over it, etc. Not all of these provisional assumptions are employed at once, but their use is varied in different cases in order to determine the significance of each one. The first analysis described is that of the curve representing the combination of two tones whose vibration rates are as 2 to 3, the consonant interval of the 'fifth.' It is shown that, in a unit of time, the portion of the partition nearest the windows will be moved up and down three times, an adjacent portion will be moved twice, and a third section once. The hair cells on these three parts of the partition, then, will mediate three tones, the first corresponding to the higher objective tone, the second to the lower, and the third to a tone an octave below the lower tone, the so-called 'subjective' difference-tone which the attentive listener hears whenever two tones of the vibration ratio 2:3 are sounded together. This relatively simple case illustrates how the author's theory undertakes to explain the facts of clang analysis and combination-tones without employing the hypothesis of physical resonators in the ear.

The particular phase in which two sound waves are combined can make no difference for hearing, according to the resonance hypothesis. According to our author's mechanical theory, varying the phase may make a difference in the relative intensities of the tones heard, a difference which is negligible for the most part but which may under certain circumstances become significant.

The theory proves to be especially adapted to meet the facts of relative intensities of difference-tones. These vary with the absolute pitch and absolute intensity as well as with the relative intensities of the two primaries. These variations are explainable in part by reference to the shape of the partition, which is only one twelfth as wide near the windows as it is at the far end of the tube. The width does not increase uniformly from one end to the other, but rapidly at first

and then more slowly. A unit movement of the stapes will displace a longer portion of the narrow part than of the wider part, and so bring about the stimulation of a larger number of nerve endings. The biological value of the resulting heightened efficiency of the weaker sounds is pointed out.

In its further elaboration, the theory is found to furnish an explanation of the phenomena of beats, of 'roughness,' and of the intertone which is heard when the primaries are about a semi-tone apart. (The author calls this the 'mean tone,' evidently being unfamiliar with the expression which the English writers have used as a translation of the German 'Zwischenton.') No attempt is made to handle such pathological phenomena as tonal islands and pitch-difference of the two ears.

The theory does not pretend to be an ultimate solution of the problems, but rather, a guiding plan for further experimental research in a field that has been unduly neglected. This mechanical theory offers a promising key to an explanation of intensity and clang-analysis; but it does not as yet, except in the vaguest and most tentative way, attempt to explain pitch.

The reviewer joins with the author in the hope that the monograph may provoke a fresh attack upon the problems of audition, problems whose solution calls for the coöperative efforts of anatomist and experimentalist.

W. V. D. Bingham.

Harvard University.

A Restudy of the Minute Anatomy of Structures in the Cochlea with Conclusions Bearing on the Problem of Tone Perception. George E. Shambaugh. Am. J. of Anatomy, 1907, VII., 246–257.

In this article the author holds the Helmholtz hypothesis untenable for the reason that he finds that a part of the membrana basilaris is so constructed that it will not admit of vibration, and that in many cases perfectly formed parts of the organ of Corti have been found where this membrane does not appear at all. His contention is that the hairs of the hair-cells of the organ of Corti, where the physical impulses of sound are transformed into nerve impulses resulting in tone perception, project into the under surface of the tectorial membrane and that stimulation is accomplished by vibrations of this membrane which are transmitted to it from the endolymph. The tectorial membrane, he believes, because he finds that it varies in size from end to end and is of a lamellar structure which renders it capable of acting as a reso-

nator, responds at a given place to a given tone, thereby stimulating certain of the auditory end-organs and consequently causing the perception of the tone corresponding to the given vibration.

The writer of this article is not alone in his contention that the basilar membrane is not a vibrating structure. In 1892, Howard Ayres, writing in the *American Journal of Morphology*, holds to this position, because he finds that the basilar membrane is composed of several sheets of fibers and cell masses and that its phylogenetic history shows it to be a modified portion of the skin which always serves as a floor on which the sense organs rest. He claims that the tectorial membrane is simply a waving field of long hairs springing from the top of the hair cell and floating freely in the endolymph. Dr. K. Kishi, in the article in *Pflüger's Archives* reviewed below, also agrees in many respects with the writer.

C. E. Moffitt.

University of Iowa.

Corti'sche Membran und Tonempfindungstheorie. K. Kishi. Archiv f. d. ges. Physiologie (Pflüger), 1907, CXVI., 112–123.

Kishi begins by deploring the present vacillation and uncertainty regarding the theory of tone sensation, and surmises that the obscure problem will be solved only when the anatomical structure of the inner ear is rightly understood. His studies of the labyrinth first led him to doubt the wide-spread view that the membrana basilaris is a vibrating structure; for the layer of basilar fibers is protected from the vibrations of the labyrinthine fluid by two thicker layers above it and two below. And even if the basilar fibers could be set in vibration, they are not in an advantageous position for actuating the hair cells and so stimulating the auditory nerve. The properties of a system of selective resonators, which Helmholtz assigned to the membrana basilaris, Kishi attributes to the little understood membrana tectoria. This conclusion is based upon investigations of the position, the physical constitution and the finer structure of this membrane. He shows that the membrana tectoria, which grows out from the labium vestibulare and extends over the organ of Corti, does not float free above the hair cells as has often been thought, but is always attached to the edge of the reticular membrane. As to its physical condition, he decides that it is very delicate but highly elastic, which accounts in part for the distortions and the bulging form usually observed in microscopic preparations. As to its finer structure, the membrana tectoria is found to consist of two layers of fibers which in the normal condition Kishi

believes to be stretched above the organ of Corti in such a manner that, when set into sympathetic vibration by sound-waves in the endolymph, they act directly upon the protruding hairs of the hair cells.

In the opinion of the reviewer, this paper taken together with Shambaugh's presents a strong case against the basilar membrane theory of audition. But Kishi's hypothesis that the membrana tectoria is made up of stretched fibers which serve as selective resonators is rendered extremely improbable by the admirable work of Shambaugh. The theory which the latter writer substitutes is, however, from the standpoint of the physicist, untenable. One feels that the anatomists have as yet failed to discover in the cochlea any structure which is physically capable of satisfying the requirements of the Helmholtz resonance theory of audition.

W. V. D. BINGHAM.

HARVARD UNIVERSITY.

PERCEPTION OF THE VERTICAL.

Influence de la force centrifuge sur la perception de la verticale. B. BOURDON. Année psychologique, 1906, XII., 84–94.

This investigation is, as its title implies, an experimental study of the effect of centrifugal force on judgments of the vertical during rotation.

With apparatus so arranged that the speed of rotation could be regulated with accuracy and so that his results could be automatically recorded, M. Bourdon made five different sets of experiments on the perception of the vertical and a sixth set on the torsion of the eyes during rotation. The first three of the sets of experiments were with the tactual perception of the vertical and consisted of: (1) Placing a rod vertical — the body being vertical and the head movable. (2) Placing a rod vertical — the body being vertical and the head immovable. (3) Placing a rod vertical — the body being vertical and the head inclined 10 degrees (that is, an amount equal to the angle formed with the vertical by the resultant of gravity and the centrifugal force). The fourth set of experiments consisted in placing the head itself in such a position that it seemed vertical; and the fifth set consisted in determining the apparent visual vertical.

M. Bourdon interprets his results as according perfectly with the hypothesis that when we turn in a circle we take for the vertical the direction of the resultant of gravity and the centrifugal force. That the figures given in the five series of experiments do not accord with

this resultant (being on an average between two and three degrees too small) he considers as simply confirming this hypothesis, since if instead of seeming to be inclined 10 degrees from the vertical I am actually so situated I obtain exactly the same results as those reported.

The fact that the apparent visual vertical showed less inclination than that of the other four cases M. Bourdon interprets as due to the torsion of the eyes, which he found to amount to between two and three degrees for the speeds used. He does not think, however, that torsion of the eyes plays a very considerable part in the illusion of the apparent visual vertical, since the difference between the results in that case and those in the other four cases was not very great. This conclusion, however, is contrary to that of Breuer and Kreidl obtained as a result of their investigations as published in *Pflüger's Archiv*, Bd. 76, p. 494 ff.

One practical conclusion which the author draws from his investigations is that it is of little use to employ the method of rotation for the study of the perception of the vertical and the role of the internal ear in its perception with the deaf, since if they show abnormalities when rotated they would show equal abnormalities if they were simply inclined an amount equal to resultant of gravity and the centrifugal force which would be used if they were rotated.

STANLEY SISSON.

UNIVERSITY OF MISSOURI.

ATTENTION.

Attention. W. B. PILLSBURY. Pp. x + 346. Library of Philosophy, edited by J. H. MUIRHEAD.

A somewhat ambitious treatment of attention is given by Professor Pillsbury in the volume which he contributes to the *Library of Philosophy*. The title leads us to look with interest for information on a subject of such importance as attention. The further we look, however, the more disappointed we become. Instead of finding out much about attention we come across discussions on the effects of attention, the conditions of attention, attention and ideas, attention in memory, attention and reason, etc. A miscellaneous amount of information is given in connection with memory, reason, emotion and the like, but attention itself receives a very subordinate place. Attempts to amplify a subject by telling of others connected with it remind one of the advertisements of the various breakfast foods, which are good *with* cream and fruit, *with* honey, etc., but which in themselves are somewhat insipid.

It is reasonable to suppose that an author in working out a subject has his field carefully defined. If he has no such field at the beginning, at least he should give approximate limitations after he has investigated the subject. We read through Professor Pillsbury's volume in vain for light in this connection. He seems to take Titchener's conception of attention as a state of clearness and at times seems to endow it with the powers of a separate activity. The first view, however, is much more clearly stated by Titchener, while the latter has no place in any modern discussion of attention. The only attempt at definition which I have been able to find is marred by the somewhat confused sequence of words in which it is given. I quote it so that the reader may judge for himself. "Attention as a state is the clearness of some one idea with its resulting analysis or synthesis. Attention as a cause is an expression of everything that the man has known and experienced, and accompanying and colouring the whole are the feelings of interest and effort, together with the movement processes that make known the degree of attention to others" (p. 293). How attention may be both a cause and an expression is not explained.

With the peculiar bias which many so-called experimenters in psychology have of ignoring the analysis and the genesis which are so prominent in such subjects as chemistry, biology, physiology, etc., the author fails to appreciate the work done by others in these fields of attention. Moreover, glaring errors are made in statement of fact and either misconception or lack of information is shown in a number of instances. For example, on page 77 the author speaks somewhat positively of fatigue of nerve cells. Now as a matter of fact nothing definite in this connection is known. (See Howell, *A Text-Book of Physiology*, 1907, p. 129.) To base a theory positively on such fatigue is to juggle with an hypothesis, a process of which the author speaks so disdainfully in his preface. Again, on page 102 the author goes to James Mill for the secondary laws which determine the strength of association. One who has read in the British associationists, however, should know that Brown gives such laws much more fully and clearly. (See his *Phil. Hum. Mind*, Lect. XXXVII.) Moreover, one who can ignore such psychologists as James and Baldwin in this connection should not at least pass by the work done by Calkins, work which is experimental, scientific and of the kind the author pretends to follow. Calkins establishes the secondary laws of association for which Pillsbury has to search in the pages of Mill. (See Calkins, "Association, An Essay Analytic and Experimental," *Psych. Rev. Mon. Sup.*, 2: 1896.) Passing by such work looks

much like special pleading. Again, one might expect a student of Titchener's to be familiar with the similarities in the theory of association between Wundt and Herbart. No notice, however, is taken by Pillsbury of the similar treatment of *Verschmelzungen* and *Complicationen* given by Herbart (*Sämmt. Werke*, Hartenstein, 5: 21–26), and by Wundt (*Grundzüge*, 3: Ch. XIX.). Pillsbury also makes the remarkable assertion that Stout's theory of apperception in the *Analytic Psychology* becomes one of activity in the *Manual*. Stout himself gives no suggestion of this. Both in his *Manual* and in his *Groundwork* Stout returns to the first love of his predecessors, association and ideal revival, though dealing with them in a more modern manner. In treating of the history of the theories of attention, Pillsbury begins with Mill and leaves out many authors of account. His selection in this connection is somewhat erratic. Of the writers of the same stamp as Mill he ignores Locke (*Essay*, Fraser's edition, 1: 194, 299), Reid, Brown and Hamilton. Mill may be a more important writer in connection with association, but as far as attention is concerned, he is of no more account than the others. I may here note that a much more systematic and thorough account of the theories of attention is given in Calkins' *Introduction to Psychology*.

The whole work of Professor Pillsbury seems more like an incomplete outline of psychology than a treatise on attention. Little of attention as such is given. What is given can be found more clearly and more fully stated in such books as Titchener's *Outline* or *Experimental Psychology*, Angell's *Psychology*, Baldwin's *Handbook*, and others. Original treatment might have been possible in an investigation of the motor aspect of attention. This, however, receives scant attention. In fact, Pillsbury calls in association centers to explain reinforcement and inhibition.

The most important application of the theory of attention is in education. As I have already stated, there is little given in connection with attention as such. Still less is presented in connection with education. The last chapter is one of the kind which throws psychology into such disrepute among teachers. The somewhat hackneyed advice is given, to know the child, to arrange lesson material properly, to give instruction of social value, etc. No mention is made of the doubtful character of any general power of attention, nor is there any notice of the work of Thorndike and Woodworth proving the impossibility of any general power (PSYCH. REV., 1901). There is consequently no discussion of the dogma of formal discipline, of the relation of the course of study to attention and inter-

est, nor are there given any practical suggestions to be followed in instruction.

The work of Professor Pillsbury is disappointing. We might expect something like it in a volume from a *Library of Philosophy*, but hardly from a writer claiming scientific definiteness and accuracy.

FELIX ARNOLD.

NEW YORK CITY.

ASSOCIATION.

The Loss of Associative Power in Words after Long Fixation. E. SEVERANCE and M. F. WASHBURN. Amer. Jour. of Psychol., April, 1907.

This paper reports an investigation of the familiar psychological phenomenon, which consists in the appearance of strangeness taken on by a word after long fixation.

Words of six letters without capitals, printed in long primer type, were placed on a background of white paper. Six women with some experience in introspection acted as observers. The subject was told to look fixedly at each word for a period of three minutes, describing all the changes undergone meanwhile in its appearance.

It was found that the meaning of the word and its auditory motor image disappeared from consciousness a few seconds after fixation. Fragments of the visual word sometimes assumed special prominence, and produced distinct auditory-motor images, which in a few cases alternated with the original word in consciousness. Later all sound and meaning elements would vanish yet the combination of visual elements retain a certain familiarity. This familiarity would then in turn vanish leaving a mere collection of letters which at last lost their identity and appeared as merely a group of strange marks.

In the first stage the word often tended to fall into symmetrical divisions, and retained both meaning and familiarity longer when these divisions corresponded with its syllables. Letters tended to associate their normal individual phonetic value. In the third stage letters of striking form such as *a* and *s*, *m* on account of its greater length, and the reversible letters such as *p* and *q* stood out with especial prominence.

The following explanations are offered by the author for these phenomena. The visual image is less closely connected with the word's meaning than is the vocal, and when the latter disappears from consciousness the meaning accompanies it. The loss of familiarity is probably due to the excessive predominance of certain parts of the word, due to the fluctuation of attention within such narrow limits.

The final loss of the familiarity of the letters themselves the author explains as a phenomenon similar or identical in nature with that displayed in the first stages of auto-hypnosis.

It would have been interesting had the experimenters tried a longer period of fixation in order to determine more exactly the relation between hypnotism and the phenomenon under investigation.

Ueber Assoziationsexperimente mit Beeinflussung der Reproductionszeit. E. MEUMANN. Archiv für die Gesamte Psychologie, IX., 117–150.

The problem here investigated is the difference in reaction time and the significance of association content, due to the form of instruction given to the subject.

The same series of words was twice given to each subject, once with each of two types of instruction.

The first type was briefly as follows: Concentrate your effort especially on producing an association as quickly as possible, leaving everything else to chance. The second type may be summarized thus: Do not react until you have exactly grasped the meaning of the word, and are sure that your answer is connected with this. Take as much time as you need and avoid haste and mental strain.

Measurements of time were taken with the Zimmermann chronoscope.

The author found that the subjects studied grouped themselves into two classes. By the first class, the first type of instruction was reacted to after a remarkably short interval. The associations were almost entirely such as the author terms non-significant, or those upon which he looks as being entirely the result of vocal and auditory habit. Such are bad, good; ice, hard; snow, white. This class of subjects when experimented on with the same words under the second type of instruction took more time than before, but their associations did not change materially in character.

The other class of subjects reacted more readily under the second class of instruction, their responses showing more concrete association. When experimented upon under the first type of instructions they were at first so confused by the distraction of attention to the time element that they were even slower than before in their reaction but became somewhat more rapid with practice.

The author points out that the uniting of the two instructions to 'get the full significance of the word' and 'react as soon as possible' is fatal to any possibility of achieving results of real value, because

of the tendency of some to emphasize the first and others the last half of the instructions. To this he attributes the wide variation in reaction time found in the results of the association experiments of various experimenters.

S. VIDA ROSS.

UNIVERSITY OF CALIFORNIA.

Some Experiments in the Associative Power of Smells. E. M. BOLGER and E. B. TITCHENER. Amer. Journ. Psych., XVIII., 326–327.

"This brief communication may be regarded as a foot-note to the study published under the same title in 1905 [in this same journal] by Misses A. Heywood and H. A. Vortriede." The question at issue is the possession on the part of odors of a peculiar power to revive past experiences. The method in both studies was a modification of Miss Calkins's form of the method of right associates. The present experimenters introduced the important variation of suffusing with the scents themselves the pictures to be linked with the several odors. Thus, like the reminiscent odors of ordinary life, the smells were bound up with 'a varied and complex visual stimulus.' The writers, however, reach, like the Vassar experimenters, a purely negative conclusion. The odors proved no more effective in recall than did nonsense syllables (auditory stimulus) and proved distinctly less so than did simple geometrical figures drawn with ink in the corners of the pictures.

E. A. McC. GAMBLE.

WELLESLEY COLLEGE.

Gustatory Audition; A Hitherto Undescribed Variety of Synæsthesia. A. H. PIERCE. Amer. J. of Psych., 1907, XVIII., 341–352.

The unique feature of this case of synæsthesia is the "experiencing of gustatory qualities following upon the hearing of words spoken by the human voice, or of musical and other non-vocal sounds." The gustatory qualities include "all the possible experiences that the sense organs of the mouth can give," the four taste qualities, pressure and temperature, and tactual-motor qualities. Olfactory sensations are not present. The article contains an extensive list of gustatory equivalents for words, nonsense syllables, and musical tones, heard by the subject, such as, Dolly, sweet; Eunice, sour or pain; idle, salt; amethyst, bitter; noise, cold; cause, hot; Ethel, pressure; Ben, tactual-motor. These gustatory associations were very distinct and followed

quickly upon the hearing of the words. "The subject feels as if she were actually having in the mouth the described substance." "The best condition for the appearance of the synæsthesia seems to be a state of natural hunger." Professor Pierce enumerates several apparently valid reasons for regarding this as an actual case of synæsthesia and not a case of artificial imagery.

DANIEL STARCH.

WELLESLEY COLLEGE.

PRACTICE, HABIT, AND LEARNING.

General Practice Effect of Special Exercise. J. E. COOVER and FRANK ANGELL. Am. Jr. of Psychol., 1907, XVIII., 328–340.

This investigation is a contribution to the answer of the question: Does improvement in one kind of mental activity extend to other mental processes more or less remote? In other words, it is concerned with so-called mental discipline.

Two groups of experiments were made: (1) Test in light discrimination with training in sound, (2) test in the use of a typewriter with training in sorting cards.

The methods of procedure, essentially the same in the two experiments, were in brief as follows: (1) The subjects underwent a period of training in one mental activity, with tests of efficiency in an altogether different activity before and after the training. (2) Care was taken to eliminate all identical motor elements, so that any possible improvement might be attributed only to some general factors. (3) Account was taken of the training effect of the preliminary test by means of control reagents, who were subjected to the tests without the training.

The conclusions are the more obvious in the first experiment. The color-discriminating ability of the subjects showed marked improvement, for which it is certainly difficult to find any explanation other than the preliminary training in sound-reactions. Introspections noted by the control reagents gave evidence of the distracting effects of varied and fantastic imagery in both preliminary and after-tests. The test reagents, on the other hand, in their final tests seemed to have reduced this to a minimum. Improvement, then, appears to depend largely upon the elimination of all unessential and distracting factors, and upon freeing the judgment from illusions such as these might occasion.

In the second experiment — the effect upon typewriting of training in card sorting — the data seem somewhat ambiguous. There is an

increase of errors along with an increase of speed; this, however, the investigators attribute to the development of a strong rhythmical tendency as the action becomes more mechanical. Introspective notes as well as the results of the actual tests seem to indicate that here also improvement was due to general rather than special factors. There was an increased general facility of accomplishment, together with a greater degree of confidence gained during the training interval. Since on the other hand the control reagents displayed much less skill and considerable more embarrassment in their final tests, the reasons for this radical difference would again seem to lie in the general practice effects of the training interval.

The general conclusions of the investigation are, then, that improvement gained in one process may be transferred to another. "Improvement seems to consist of divesting the essential process of the unessential factors," and the factors in this transfer of improvement are due in great part to habituation and to a more economic adaptation of attention, *i. e.*, are general rather than special in character.

The fact that the results found by Coover and Angell differ from the conclusions of other investigators makes it very desirable that the question be submitted to the most rigid experimental investigation. There are few, if any, questions of more fundamental importance to education.

A. HAYWARD CHALLISS.

WASHINGTON UNIVERSITY, ST. LOUIS.

The Psychology of the Learning Process. LUCINDA PEARL BOGGS. Jr. of Phil., Psychol. and Sci. Methods, 1907, IV., 477–481.

Basing her article in part on Herbart's pedagogy and psychology, Miss Boggs leans perhaps too much toward philosophy instead of using the many experiments that have been made in the psychology of learning.

When learning is taking place in the best way there are, according to our author, four things that should be taken into account. First, the proper attitude of the mind is a 'state of inquiry.' One never learns anything while in a condition of indifference. Secondly, the 'content of the mind' also determines the success of the learning Process. In this, interest must necessarily play a great part.

In the third and fourth divisions there seems to arise a too delicate division of the subject-matter. The author speaks of 'the form of the content of consciousness' and 'the structure of consciousness.' In dealing with the content of consciousness, the process of real learning

is making the subjective objective. School-room methods are too much occupied with getting a clear language expression of the content of children's minds. In the hurry to complete a given topic time enough is not allowed for the ideas to expand, subconsciously, in the child's own way, and this hot-house growth gives an artificial product. Everything that exists for our consciousness has to be worked over in our own brain. The teacher cannot take it for granted that the pupil has the same consciousness in dealing with exactly the same material, and even in the same form, when learning, that exists later when the subject is learned.

By the structure of consciousness the author means memory, imagination, inductive and deductive reasoning. She agrees that memory is necessary where the aim is to solidify the objective language statement, but this comes after the learning process is completed, when the subjective has been made objective, and conforms to the definite relations of time and space, of cause and effect. Learning, on the other hand, is a condition of mental integration and disintegration in which the ideas are as yet too indefinite and vague for memorization, and here imagination, the prevailing organization of children's minds, as the author finds, must have free scope.

ROSE LENORE COHN.

WASHINGTON UNIVERSITY, ST. LOUIS.

The Psychology of Chess and of Learning to Play it. ALFRED A. CLEVELAND. Amer. Jour. of Psychol., 1907, XVIII., 269–308.

Like many other games which arouse intense interest, chess owes its popularity to its appeal to the fundamental instinct of combat and to the fact that it opens the way for origination and invention. Cleveland describes the game of the average player and cites instances of remarkable feats of well-known chess masters, and then takes up the learning process as illustrated by the game. The player, after passing through the various stages of growth in skill from a condition in which he can plan only the next move, reaches a condition in which he is able to think out a long line of defense and attack. The preliminary details are now becoming automatized and the mind is left free for the larger aspects of the game. At this stage of the learning process the beginner has more knowledge than he can put to practical use; his mind has grasped many details which it has not yet organized for ready employment. The player who has reached a reasonable degree of skill has learned to use large units of thought. He is enabled to make short cuts in planning by ignoring the intermediate steps which would otherwise hamper his outlook.

Cleveland agrees with Swift in finding that skill, instead of being diminished, is more often increased by a period of rest.

In conclusion, Cleveland considers that the progressive organization of knowledge is the most important psychological feature in learning chess, though a good visual imagination or its substitute in some other form of imagination, such as auditory, is desirable.

The article, while complete in other ways, does not give in sufficient detail the factors of the learning process which are peculiar to chess. For instance, attention and association are used in too comprehensive a way without sufficient analysis to determine the other mental processes involved in the group of activities to which these terms are applied. The article, however, is valuable as a contribution to the psychology of learning.

FRANCIS PAGE HARDAWAY.

WASHINGTON UNIVERSITY, ST. LOUIS.

Mathematical Prodigies. FRANK D. MITCHELL. Amer. J. of Psych., 1907, XVIII., 61–143.

The object of this paper, as stated by the author, is three-fold: "(1) To give a summary of the mathematical prodigies described in the literature of the subject. . . . (2) To give a brief account of the writer's own case. . . . (3) To set forth a new theory of mental calculation."

We may pass over the first two sections of the work with a few words. In the first the various prodigies recorded in history, some twenty odd, are treated of in detail with respect to their mathematical abilities, heredity, education, etc. The source for these accounts appears largely to have been found through references in Scripture's earlier article on 'Arithmetical Prodigies' (*Amer. J. of Psych.*, 1891, IV., 1–59). This original work of Scripture is treated throughout with a rather carping criticism, to some extent no doubt justifiable, but on the whole rather annoying in its petty detail.

In the account of his own case the author reveals certain of the methods and tricks of calculation, and lays the basis for his theory by deriving the calculating ability from a natural interest quite prior to all knowledge of or education in mathematics. As to the theory, he develops it from counting, and lays stress on the natural tendency towards a precocious skill in this direction. Education, therefore, is of little avail, and indeed may act as a hindrance to the development of this natural tendency.

Three grades of ability are differentiated: (1) Pure counting in abbreviated form, which takes into account the properties and short-

cuts in numerical operations, and cannot even be called arithmetical. Persons possessing this grade of ability are termed 'calculating prodigies.' (2) A distinctly arithmetical point of view is developed in the 'arithmetical prodigies' whose operations are shown to be true calculations rather than dealings with the mere properties of numbers. (3) Real mathematical ability is found in the 'mathematical prodigy' whose powers are distinctly algebraic and generalizing. It will thus be seen that mental calculation and mathematical ability are essentially independent, and we are made to understand how a high degree of calculating ability may be combined with dense ignorance and illiteracy.

Although developing primarily from counting, it is shown that the favorite operation of the mental calculator is not addition and subtraction but multiplication. Various unique forms of multiplication are described, but as for the extended multiplication table, except in two of the cases studied, the author finds no evidence for its use nor any real need for its acquisition.

Binet's conclusion that mental calculation combines two distinct and independent elements, memory and calculation, is rejected. Memory is declared to be of importance only in the service of the calculation, and not as a distinct capacity.

As to memory type, the author takes issue with Scripture, who found three of the calculators here treated to be notably visual, and assumed that the visual factor was probably the most important one for all such operations. According to Mitchell's analysis the three named by Scripture as visual are rather to be considered auditory in type, and the general conclusion is that the auditory is probably the more natural method since the calculator usually develops his ability before he learns to read or write. In the opinion of the reviewer the evidence on this point is insufficient. The author's main criterion for the auditory 'or auditory-motor' type is a tendency to articulate. But the necessary combination of auditory with motor factors is by no means self-evident. Netschajeff[1] experimenting on 700 Russian cadets found that he could classify but 11 per cent. as belonging to one of three types: visual 5 per cent., motor 4 per cent. and auditory 2 per cent. Forty-nine per cent. could be classified as favoring a combination of two forms of imagery, 32 per cent. being visual-motor, 12 per cent. visual-auditory but only 5 per cent. auditory-motor. Experimentation on this subject is attended by many diffi-

[1] *Ueber Memorieren;* Sammlung von Abhandl. aus dem Gebiete der Pädag. Psychol., V. Band, 5. Heft, Berlin, 1902.

culties, and I shall not assume absolute trustworthiness for these results, but at least they indicate the doubtful validity of determining a preponderance of auditory imagery from indications of articulation.

The article concludes with two appendices, one defending the autobiographical evidence of one of the calculators against the attacks made on it by Scripture and Binet, the other containing a carefully constructed table of the principal prodigies, indicating facts relative to heredity, development, education, mental calculation, memory, etc.

ROBERT MORRIS OGDEN.

UNIVERSITY OF TENNESSEE.

L'acquisition des habitudes chez les animaux. GEORGES BOHN. Année psychologique, 1907, XIII., 170–206.

Bohn considers the ability to acquire new habits the measure of the mental life of animals. His experiments, which were similar to those performed a few years ago by Yerkes, Thorndike, and Kinnaman, indicate that animals carry the memory of successful movements from one situation to another. They manifestly tried to repeat the movements which led to the desired result.

The animals with which Bohn experimented, like those tested in the earlier investigations, gradually learned to eliminate useless acts and to repeat the successful ones until finally they settled upon those essential to the accomplishment of that for which they were striving. Bohn cites numerous experiments upon cold blooded vertebrates, anthropodes, worms, mollusks, and protozoans. He found that the green frog profited slowly from experience, as is the case with the majority of cold blooded vertebrates, chiefly because of their tenacious instincts and individual habits.

As the result of these experiments, Bohn concludes that the mechanism for the acquisition of habits among animals low in the scale does not differ greatly from that which governs the acquisition of habits among those which are higher.

If the ability to profit from experience be the criterion of intelligence, the dog according to Bohn is more intelligent than the cat, since it learned to eliminate useless movements more quickly and was more clever in making short cuts. It is possible, however, that this was due to individual rather than specific differences. After the cat had learned to react to the sentence, "I am going to feed my cat," it required eighty additional days to learn to distinguish between that statement and its negative, "I am not going to feed my cat."

Bohn's monkeys, like Kinnaman's, learned to associate the shapes

of vessels with the food which they contained. After each trial the position of the vessels was changed and they were grouped differently. Associations connecting the size of the receptacles with their contents were established with greater difficulty because the monkeys were tempted to choose the largest vessel, as if they thought it ought to contain the greatest quantity of food. All of the experiments showed that movements ill-adapted to success were progressively eliminated, while movements well adapted took place more frequently, and each time with more certainty.

THOMAS FURLONG, JR.

WASHINGTON UNIVERSITY, ST. LOUIS.

EXPERIENCE AND REALITY.

Pure Experience and Reality. EVANDER BRADLEY MCGILVARY. Philos. Rev., 1907, XVI., 266–284.

A tenable system of philosophy must be compatible with scientific facts. The philosophers of pure experience, postulating as they do that the real is the immediately experienced, feel in duty bound to set themselves right with science which deals with realities purporting to exist prior to experience. Professor James reconciles his experiential philosophy with science by tacitly admitting the existence of a genuine reality which is not necessarily experienced. Professor Dewey attempts the reconciliation by allowing the existence of a something 'non-contemporaneously experienced.' But inasmuch as the cornerstone of his system is the theory that the condition of all reality is contemporaneous cognitive experience, this preëxperiential something cannot have complete reality. The scientist, however, in his statement of the nature of his objects, asserts their reality, ignoring the experience which conditions that reality; but he does so, Professor Dewey contends, only because he is not concerned with their 'extra-scientific features,' and because the experience factor is so unavoidably there in experience. This contention of Professor Dewey involves a serious confusion. That experience is necessary for the recognition of scientific reality is a fact which the scientist does not ignore. The telescope, for example, testifies to the astronomer's acceptance of this truth. But the preëxperiential object of the scientist stands in no need of a *contemporaneous* cognitive experience to make it real, and when Professor Dewey makes this assertion the scientist not only ignores it but rightly treats it as a gross assumption.[1] The object exists

[1] Cf. Professor Dewey's 'Disclaimer,' *Philos. Rev.*, 1907, XVI., 419–422.

as a complete reality, independent of the mutations in any single experience.

An examination of the theory of representative knowledge gives the answer to the question, how can a reality, existing prior to experience, become an object of subsequent experience of it? We have subjective images or ideas which represent previously experienced realities, present realities not immediately experienced, past and future realities which have and have not become objects of our immediate experience. These representative images bear a direct reference to the transsubjective realities, and we come to know the reality through the image.

HELEN G. HOOD.

WELLESLEY COLLEGE.

MONISM.

Les objections au monisme. F. LE DANTEC. Revue Philosophique, LXII., 114–135.

Quoting the statement of one who, in religious matters, had persistently maintained the attitude of a free-thinker yet who had sought to transcend the doctrines of materialism and positivism on the ground that *they were not sufficiently comforting*, the author says that nearly all of the objections to monism spring from analogous considerations. They are based on what Ribot calls 'the logic of sentiment.'

The monism which the author supports he first strips of all metaphysical implications. To hold a monistic conception of the world it is not necessary to reduce all phenomena to unity; monism is rather a formula. This formula maintains that nothing transpires which can be recognized by man which does not involve transformations which are susceptible of measurement. 'Susceptibility of measurement' is made the watchword of the monism which the author regards as a recent acquisition of human thought. This monism is not to be identified with the materialism of the ancients.

The dualism to which this monism is opposed is clearly stated by Pasteur, who says that "in each of us there are two men: the man of wisdom, who by observation, experimentation, and reason, hopes to arrive at a knowledge of nature, and the man of tradition, the sensitive man, the man of faith or of doubt, the man of sentiment, the man who does not wish to die but who believes that his essential nature will live on."

This dualism admits the existence of immutable entities that act without being themselves modified and to these immutable entities the

dualists attribute both the direction and the setting in motion of all the activities which are changed into measurable modifications.

The author does not pretend to deny the existence of these immutable entities but leaves the subject to the metaphysicians, holding that on this subject each one can hold the opinion which best pleases him.

The important observation is made that, ordinarily, men are monists or dualists, as the case may be, from temperament or habit and not by reflection or reason. From considerations based upon advancements made in scientific research, however, the monist feels constrained to challenge the position of the dualists who hold that there is a directing entity independent of the corporeal mechanism. For the dualist this independent entity is a necessary presupposition to the doctrine of individual freedom. The monist, however, interprets freedom in terms of the biological relationship of the organism to the environment. From this point of view there is nothing which, to him, can destroy the validity of the monistic formula, that nothing transpires in man which does not produce modifications which are susceptible of measurement.

A. D. SORENSEN.

TEMPLE UNIVERSITY, PHILADELPHIA.

COLOR VISION.

Ein Fall von ungewöhnlicher Verschiedenheit der Mischungsgleichungen für beide Augen eines Beobachters. A. SAMOJLOFF. Zeitschr. f. Sinnesphysiol., 1906, Bd. 41, 367–372.

Professor Samojloff gives a brief report of his own anomalous color perception. The same object, for example a human face, appears more red to one eye and more yellow to the other. A series of experiments was made according to v. Kries's method of equating a mixture of red and green with different homogeneous lights between red and green. The quotient of the red-green mixture for the two eyes was found to vary with the different wave-lengths of the homogeneous light. The inference is made that the anomaly is due to differences in the physiological excitability of the two eyes.

DANIEL STARCH.

WELLESLEY COLLEGE.

BOOKS RECEIVED FROM MAY 5 TO JULY 5.

Mind in the Making. E. J. SWIFT. New York, Scribners, 1908. Pp. viii + 329.

Elementary Experiments in Psychology. C. E. SEASHORE. New York, Holt, 1908. Pp. xii + 218.

Nuova classificazione dei delinquenti. J. INGEGNIEROS. Milan, Sandron, 1908. Pp. 80.

Moral Training in the Public Schools. California Prize Essays. C. E. RUGH and others. Boston, Ginn & Co., 1908. Pp. v + 203.

L'Education de la femme. M. C. SCHUYTEN. Bib. biol. et sociol. de la femme, ed. by Toulouse. Paris, Doin, 1908. Pp. xiii + 458. 4 fr.

La Pellagre. A. MARIE. Paris, Giard et Brière, 1908. Pp. 252. 4 fr.

Psychology. F. ANGELL. 4th ed. New York, Holt, 1908. Pp. xi + 468.

Die biologische Theorie der Lust und Unlust. D. C. NÁDEJDE. Heft I. Leipzig, Engelmann, 1908. Pp. 99. M. 2.40.

Grundzüge der physiologischen Psychologie. W. WUNDT. 6te Auf. Bd. I. Leipzig, Engelmann, 1908. Pp. xvi + 725. M. 13.

Essays Philosophical and Psychological in Honor of William James. G. S. FULLERTON and others connected with Columbia University. New York, Longmans, Green & Co., 1908. Pp. viii + 610. $3.00 net.

Les inclinations, leur rôle dans la psychologie des sentiments. G. RÉVAULT D'ALLONNES. Paris, Alcan, 1908. Pp. 228. Fr. 3.75.

Social Psychology. E. A. ROSS. New York, Macmillan, 1908. Pp. 372.

Evolutionnisme et Platonisme. Mélanges d'histoire de la philosophie et d'histoire des sciences. RENÉ BERTHELOT. Paris, Alcan, 1908. Pp. iv + 326. Fr. 5.

Psychologie des neurasthéniques. PAUL HARTENBERG. Paris, Alcan, 1908. Pp. 248. Fr. 3.50.

La synthèse mentale. GEORGES DWELSHAUVERS. Paris, Alcan, 1908. Pp. 276. Fr. 5.

L'Année philosophique ; année 1907. F. PILLON, editor. Paris, Alcan, 1908. Pp. 288.

On the Witness Stand. HUGO MÜNSTERBERG. New York, McClure, 1908. Pp. 270. $1.50 *net.*

Religion and Medicine. ELWOOD WORCESTER, SAMUEL MCCOMB, ISADOR H. CORIAT. New York, Moffat, Yard, 1908. Pp. 428. $1.50 *net.*

Hybrid Parts of Speech. EDWARD G. OWEN. (Repr. fr. Trans. of the Wisconsin Acad. of Sci., XVI., Pt. II.; May, 1908.) Pp. 150.

The Concept of Control. SAVILLA ALICE ELKINS. (Arch. of Philos., ed. by F. J. E. Woodbridge, No. 1.) New York, Science Press, 1907. Pp. 40.

NOTES AND NEWS.

DR. ADOLF MEYER, head of the Pathological Institute of the New York State Commission in Lunacy, has been unanimously appointed professor of psychiatry and director of the psychiatric clinic at the Johns Hopkins University, the appointment to take effect in September, 1909. Mrs. Henry Phipps has recently donated a building with adequate equipment, and has provided for the maintenance of the clinic and chair for ten years.

DR. HARVEY CARR, professor of psychology in the Pratt Institute, will succeed Dr. J. B. Watson (professor-elect in the Johns Hopkins University) as assistant professor of psychology in the University of Chicago. Dr. Carr will have charge of the work in comparative psychology and will share in the conduct of the general experimental course.

DR. CLARENCE S. YOAKUM, of the University of Chicago, has accepted a position as instructor in psychology at the University of Texas.

THE degree of M. A., requiring a bachelor's degree, two years graduate work, and a suitable thesis, has been established at the Johns Hopkins University. It is designed to meet the requirements especially of teachers who enroll in the courses in Education, Psychology, etc., in the University.

DR. H. HEATH BAWDEN, late professor of psychology at the University of Cincinnati, announces a series of four books and four pamphlets on philosophical topics to appear shortly. The larger volumes are entitled *Principles of Pragmatism*, *Principles of Education*, *Principles of Æsthetics*, and *Poems*. The articles now appearing in the PSYCHOLOGICAL REVIEW will form part of Dr. Bawden's volume on æsthetics.

WE have received the first number of *La Revue Psychologique*, a quarterly, edited by J. Joteyko (Brussels, Rossel, 8 fr. a year).

THE following are taken from the press:

AT Harvard University Dr. Robert M. Yerkes has been promoted to be assistant professor of comparative psychology, Mr. D. C. Rogers has been appointed instructor in applied psychology, and Mr. J. H. Woods has been promoted to the rank of assistant professor of philosophy.

WARNER BROWN, Ph.D. (Columbia), assistant in psychology in Columbia University, has been appointed instructor in psychology at the University of California.

PROFESSOR CHARLES H. JUDD, of Yale University, will lecture in the new department of psychology and pedagogy at Chautauqua this summer.

MR. H. B. ALEXANDER has been appointed professor of philosophy at the University of Nebraska.

THE George Washington University (D. C.), has established a separate department of psychology, with Williston S. Hough, Shepherd Ivory Franz, and William Carl Ruediger as teaching force. There will be two laboratories, one for elementary instruction and educational problems, and one for the advanced work of graduate students.

AT the Ohio State University Dr. T. H. Haines has been promoted from assistant professor of philosophy to professor of psychology, and Dr. A. E. Davies has been advanced to the rank of professor of philosophy.

DR. CHARLES E. CORY, who has been acting assistant professor of philosophy at Washington University (St. Louis), has been put in charge of the department of philosophy.